

Red Guides Paper 31

Objective Testing

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Red Guides address educational and staff development issues within Higher Education and are aimed at colleagues within the University and at other institutions. Some describe current good practice in Higher education, others evaluate and/or comment on curriculum development and many provide ideas for teaching. All are meant to stimulate discussion, initiate action and implement change.

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Introduction

This guide is to examine the role which objective tests can play in improving the efficiency and effectiveness of teaching in terms of both assessment and feedback for students.

An objective test is one in which the questions, or 'items' are asked in such a way that for each there is only one correct answer. This means that an objective test is constructed so that the score a particular student achieves is not dependant on the marker's judgement, thus removing the subjectivity in the marking. Although there is no clearly defined format for the items in such a test, multiple choice items are probably the most common and are therefore used for the purposes of this guide.

The guide is split into three parts. Part one looks at the outcomes which objective test questions are appropriate to assess, thus enabling a lecturer to identify an area of a chosen syllabus suitable for this form of testing. In part two the writing of objective test items is considered, while part three examines the way in which multiple choice questions can provide an excellent opportunity to offer an efficient form of feedback.

1. Learning Outcomes which Objective Test Items are Appropriate to Assess

When trying to establish whether or not a learning outcome is suitable for assessment by means of objective testing, consideration should be given to the level of sophistication of the mental processes involved.

Bloom, in his '**Taxonomy of Educational Objectives**', categorised the cognitive domain (intellectual capability) into six levels of learning development, which he ordered in a hierarchical manner in accordance with their respective levels of difficulty.

These are (in ascending order):

1) Knowledge

2) Comprehension

3) Application

4) Analysis

5) Synthesis

6) Evaluation

A premise of the Taxonomy is that each of the categories should be mastered in order, with knowledge a necessary precondition for putting the subsequent higher level skills and abilities into practice.

Multiple choice questions are best suited to assessing outcomes in the lower to middle part of the cognitive domain, i.e. for assessing knowledge, comprehension, application and analysis.

Once the suitability of using objective test questions has been established, thought can then be given to the writing of the items.

2. The Writing of Objective Test Items

Item Format

A multiple choice item consists of a **stem**, (which poses the problem), followed by the **options** (or the possible solutions), where the correct option is known as the **key**, and the remaining options as the **distractors**. For example:

Stem Which of the following is an odd number?

Options:

Distractors	-	A	Two
	-	B	Four
	-	C	Six

Key **D** **Three**

A The stem (The first part of the item, stating the task to be performed)

i) Specifying the question

The stem must always provide enough information to enable an item to be answered correctly.

For example: **Which of the following is the odd one out?**

A Satsumas

B Carrots

C Oranges

D Pears

In this item, the stem does not give sufficient information as there is no guidance given regarding the criteria that needs to be applied. Pears could also be the odd one out because of their colour. The stem could therefore be improved by rewriting it as - **Which of the following is a vegetable?**

ii) Be clear

The writer must avoid setting ambiguous questions, for example items which require assumptions to be made or perhaps those which rely upon a particular opinion or viewpoint being expressed. In general, clarity can be improved by avoiding complex language in the stem, and by presenting the question in several short sentences rather than in a single long one.

iii) Take into account the length of the test

Depending upon the time constraints of the test, individual items should not take too long to complete. For example, in a 2 hour test with 50 objective items, the average student can spend no more than two and a half minutes on any given item if he or she wishes to complete the examination within the time limit. If lengthy questions are included, then they must be balanced by a sufficient number of elementary items which can be answered in a shorter period of time.

iv) Negative items

Positively-phrased test items tend to measure more important learning outcomes than negatively-phrased items.

Knowing the best method or the most relevant argument generally has greater educational significance than knowing the poorest method or the least relevant argument. If negative presentation is absolutely necessary, the writer must use some form of emphasis (e.g. italics, bold type, capitals or underlining) to bring this to the attention of the students.

For example: **Which of the following is *not* a European country?**

- A Wales
- B Brazil**
- C England
- D Scotland

In answering the item correctly the student does not have to know where in the world Brazil is, simply that it is not a European country. The question would have greater educational value if it were to be rephrased as - **Which of the following countries is located in South America?**

B Options (All the responses offered as possible answers)

i) **Grammar**

Care must be taken with grammar, particularly when the options complete a sentence which is given in the stem.

For example: **An animal with a trunk and floppy ears is an**

- A Lion

B Giraffe

C Elephant

D Tiger

Clearly the use of the word 'an' in the stem gives the answer away.

ii) **Similarity**

Options which stand out may give away clues as to the correct solution.

For example: **When does research suggest that the temperature of an industrial city reaches its lowest level?**

A In the morning

B In the afternoon

C In the evening

D At weekends when factories and offices close down and the workers head off out into the countryside.

Option D is longer and is also qualified, thus making it seem to be the most likely solution.

iii) **Credibility**

All distractors (incorrect solutions) must be credible. If a distractor can be dismissed straight away, the chance of a student being able to guess the correct answer by chance is increased from 25% to 33 1/3% when four alternatives are provided. For example in the case of numerical items,

incorrect options should be capable of being derived from the misuse of some formula or method and not just from some slip in the calculations.

For example: **What is 0.25 divided by 0.01?**

- A 0.0025
- B 0.025
- C 2.5
- D 25**

Options A, B and C are all plausible distractors as they each reflect a possible error that a student could make.

iv) **Well used text book phrases**

Use of stereotype phrases and clue words should be avoided as they can attract students to an option for the wrong reasons.

For example: **Which body sets European law?**

- A) The Kremlin
- B) The Senate
- C) The European Parliament**
- D) The House of Lords

As '**European**' appears in the stem and also in option C, students may be drawn to that option.

v) **User Friendly**

To reduce the risk of a student working out the correct answer but then selecting the wrong option, numerical options should be shown in increasing or decreasing order and where appropriate, to the same number of decimal places.

For example: **What is one half expressed as a percentage?**

A 10%

B 25%

C 50%

D 75%

vi) **Mutual Exclusivity.**

Ensure that all options, whether numerical or written, are mutually exclusive.

For example: **Which of the following characters appear(s) in the film 'The Wizard of Oz'?**

A Noddy

B Noddy and the Tin Man

C Noddy and the Scarecrow

D The Tin Man and the Scarecrow

In this item, if a student knows that option A is not correct, they will then be able to ascertain that options B and C are also incorrect as they also involve Noddy.

C The Key (The correct answer)

The key must be the only correct option. Where a 'best answer' solution is required to the problem, it is important that all of the moderators agree that the key is the best solution, otherwise several answers may be justified and objectivity would be eliminated.

D eLearning Portal (Blackboard)

At Northumbria University a test can be set up on the eLearning Portal (eLP) relatively easily by clicking on 'Course Tools' - located in the course management section of the menu tab on the module home page - and then clicking on 'Tests, Surveys and Pools'. The 'build test' tab allows you to enter a name, description and instructions for the test. A range of question types, including multiple choice, true/false, fill in the blank, ordering and opinion scale/Likert are then available. Values can be assigned to each question so as to allow weighting if required. Questions can also be randomised and set such that partial credit can be awarded if needbe.

Once a test has been created it can then be transferred to a content area within eLP, e.g. assignments. This is carried out by clicking on the required content area within the main menu tab, and then clicking on 'test' in the assessments tab. An existing test can then be added, or a new test can be created directly in this content area. It is then possible to modify the test options, for example to allow multiple attempts or to force completion the first time it is launched. Time limits for completing the test can also be set and release dates.

Detailed help guides on eLP functionality are located on the eLP home page under 'More Help'.

3. Feedback and Review

Feedback for students

Objective testing, particularly when set through the eLP, can be an efficient means of providing formative feedback. Students can be given their scores instantly, together with a detailed question by question analysis of their responses. Feedback should be provided not only as to why an answer is wrong, but also why the correct answer is right. This will enhance students' knowledge and understanding of a topic, whilst at the same time acting as a self-check, assisting them in being able to assess whether or not they fully understand the particular subject area.

Feedback to the tutor

In addition to providing useful feedback to students, the recording of marks and responses within the eLP gradebook will enable the tutor to quickly identify individual and cohort performance for each topic assessed. Items can subsequently be worked through in class, with particular attention being paid to any questions which on the whole were answered badly. Students should be given every opportunity to ask questions, and this feedback will enable any areas of uncertainty (perhaps not picked up by the tests) to be clarified.

Review

Items will often need to be redrafted several times before they can be regarded as 'good'. Items which are too easy (more than 70% of students answer correctly) or too difficult (less than 30% of students answer correctly), or distractors which fail to elicit a sufficient number of responses (attract less than 5% of the total responses), should be amended. These assessment statistics are readily available through the eLP grade centre.

Conclusion

Having identified learning outcomes that are suitable for objective testing, the questions, although taking a long time to write, do enable the writer to cover a wider spectrum of knowledge than would otherwise be possible in a predominantly narrative test (where longer written and numerical case study type questions are set, only able to test one or two concepts or applications). This wider subject matter reduces the temptation for students to question spot, and accordingly reduces the likelihood of the marker giving a premium to the successful question spotter. The chance element in the assessment is thereby reduced and a student's approach to the test becomes less of a gamble.

As regards feedback, scores and a question by question analysis of their responses are instantly available to students. Tutors can quickly identify areas of the syllabus and/or particular students requiring further attention, and as the questions can subsequently be worked through in class, a wider course content area can be covered in greater detail than might otherwise be possible. This aspect is particularly useful for courses with large syllabi and limited testing and assessment time. Other forms of assessment are important but objective testing can have a part to play.

In short, objective testing can produce an efficient formative or summative assessment strategy, which can be beneficial to both students and tutors. However the preparer must always bear in mind that item construction is not something that can be dashed off in an odd moment, put on paper, scored and forgotten!

Further Reading

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